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Mathematical Literacy in Mathematical Learning Visual Auditory Kinestetic (VAK) Model Using The Mathcitymap Application

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Abstract

The aim of this research is to determine the quality of mathematical literacy in VAK model learning using mobile math trails, as well as to determine and describe mathematical literacy in VAK model learning. This research method uses quantitative research methods using cluster random sampling techniques by dividing the sample into 2 groups, namely the experimental group and the control group. The quality of the VAK model learning outcomes using the Math City Map application in this research will be measured using a completeness test, a different literacy ability test, and a literacy ability improvement test, which will previously be tested for normality, homogeneity, and an independent t-Test comparison test on pretest data. and posttest. It can be concluded that the average increase in mathematical literacy in VAK learning using the MathCityMap application is higher than students' mathematical literacy in PBL learning

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Keywords: literacy, mathematics, visual, auditory, kinesthetic

Abstrak

Tujuan penelitian ini adalah untuk mengetahui kualitas literasi matematika pada pembelajaran model VAK dengan menggunakan mobile math trails, serta untuk mengetahui dan mendeskripsikan literasi matematika pada pembelajaran model VAK. Metode penelitian ini menggunakan metode penelitian kuantitatif dengan menggunakan teknik sampel cluster random sampling dengan membagi sampel menjadi 2 kelompok yaitu kelompok eksperimen dan kelompok kontrol. Kualitas hasil pembelajaran model VAK dengan menggunakan aplikasi Math City Map pada penelitian ini akan diukur menggunakan uji ketuntasan, uji beda kemampuan literasi, dan uji peningkatan kemampuan literasi, yang sebelumnya akan dilakukan uji normalitas, homogenitas, dan uji banding independent t-Test pada data pretest dan posttest. Dapat disimpulkan bahwa rata-rata peningkatan literasi matematika pada pembelajaran VAK menggunakan aplikasi MathCityMap lebih tinggi dari literasi matematika siswa pada pembelajaran PBL.

***Kata Kunci**: literasi, matematika, visual, auditori, kinestetik*

Introduction

Mathematics is a unique scientific discipline compared to other scientific disciplines, so it requires a teaching and learning delivery process that is different from other sciences. The experience of studying mathematics continuously will make it easier for someone to learn new mathematical material (Herman Hudoyo, 1990; 5). In the 2013 curriculum, the content material in mathematics learning has developed a balance between

mathematics with numbers and without numbers (pictures, graphs and patterns). In order for students to be able to understand mathematics without numbers, students need good literacy skills. This will make Indonesian students more advanced and able to think critically and logically in dealing with everything.

PISA (International Program for Student Assessment) is an international study that has a program, one of which is assessing the reading, mathematics and science literacy achievements of students from several countries. Based on the PISA survey, Indonesian students have low mathematical literacy skills (Syawahid & Putrawangsa, 2017), (in Hamidah, 2018) stated that in PISA 2015, Indonesia was included in 10 countries with low literacy skills by occupying 69th position out of 76 countries surveyed by PISA.

According to Wardono and Mariani (2014), Indonesian students' ability to solve problems that require the ability to analyze, reason, communicate effectively, and then interpret solutions in various situations is still low. Apart from that, the low mathematical literacy of Indonesian students is also influenced by their weak mathematical reasoning (Wardhani and Rumiati, 2011; Ni'mah et al, 2017).

Mahdiansyah and Rahmawati (in Hamidah, 2018) said that there are several factors that influence the results of achieving mathematical literacy in Indonesia, including instructional factors, personal factors, and environmental factors. To determine students' mathematical literacy abilities, educators make efforts to select innovative learning models, one of which is the visual, auditory and kinesthetic learning model (VAK). According to Noorbaiti, R et al (2018), the VAK learning model classifies student learning styles into 3 groups visual (tendency to learn by seeing), auditory (tendency to learn by hearing), and kinesthetic (tendency to learn by moving). This learning model can be interpreted as meaning that learning is carried out by utilizing the potential students already have by training and developing them (Febrilyani, W. L. 2019). This is supported by the results of research from Fatya Azizah and Scholar Ad Dien (2017) which states that the VAK learning model can improve mathematical understanding abilities which can be seen in the increase in the average total score in cycles 1 and 2, namely 3.59 to 4.33 .

Learning media is a tool used to carry messages or information that have instructional purposes or contain teaching purposes (Azar Arsyad, 2009). One media that is suitable for use in learning today is using the MathCityMap application. By using this application it is hoped that it will foster student learning independence in finding and solving problems.

Learning independence is one of the important variables that influences students' mathematical literacy independence. This research aims to determine mathematical literacy skills in VAK model mathematics learning using the MathCityMap application.

Research Methodology

This research used quantitative methods which were carried out at SMP Negeri 1 Trangkil. The population in this study were class VIII students in the even semester of the 2022/2023 academic year. Sampling in this research used a cluster random sampling technique, namely randomly selecting two classes from the population with a total sample from both classes of 50 students. The two sample classes are the first class at SMP N 1 Trangkil class 8H as an experimental class taught with the VAK model using the MathCityMap application and the second class at SMPN 1 Trangkil class 8I as a control class using the PBL (Problem Based Learning) model.

The quality of mathematical literacy in VAK learning using the MathCityMap application is divided into the quality of the learning process and the quality of student learning outcomes. The quality of the

learning process will be measured using three observations, namely teacher skills, student creativity, and observations of learning implementation.

The quality of the VAK model learning outcomes using the MathCityMap application in this research will be measured using a completeness test, a different literacy ability test, and a literacy ability improvement test, which will previously be tested for normality, homogeneity, and an independent t-Test comparison test on pretest and posttest data.

Completeness testing was carried out on post-test data on mathematical literacy abilities from the experimental group using a one-party test. The test for differences in literacy ability uses the right-sided t test statistic which was carried out on the post-test score data for the experimental and control groups. Next, the pre-test and post-test data from the experimental and control groups will be tested to determine the increase in students' mathematical literacy skills.

Results and Discussion

Tables 1, 2 and 3 present the results of observations which are used as a measuring tool for the quality of the learning process. Based on table 1, it is known that the percentage of skills observation results for teachers at the first meeting was 80% in the good category. At the second meeting it increased to 90% in the good category, and at the third meeting it increased again to 95% in the good category. It is known that the average of the results of observing teacher skills based on the three meetings that have been held is 88% in the good category.

Table 1. Percentage of Observation Results of Teacher Skills

Meeting to	Percentage	Category
1	80%	Good
2	90%	Good
3	95%	Good
Average	88%	Good

Table 2. Percentage of Student Activity Observation Results

Meeting to	Value Percentage	Category
1	77%	Good
2	80%	Good
3	83%	Very Good
Average	80%	Good

Table 3. Percentage of Learning Implementation Observation Results

Meeting to	Value Percentage	Category
1	70%	Good
2	88%	Very Good
3	94%	Very Good
Average	84%	Very Good

Meanwhile, based on the results of observations of student activities presented in table 2, there has also been an increase at each meeting. It is known that the percentage of scores at the first meeting was 77% in the good category. Then at the second meeting, the percentage score was 80% in the good category. At the third meeting it increased to 83% in the very good category. The average percentage value from observations of student activities is 80% in the good category. At the first meeting it was discovered that the percentage score was 70% in the good category. at the second meeting the percentage score was 88% in the very good category. then at the third meeting the percentage score was 94% in the good category. The average percentage value from observations of learning implementation is 84% in the very good category.

Based on the results of observations of learning implementation presented in table 3, it shows that the percentage of scores has increased at each meeting. At the first meeting it was discovered that the percentage score was 70% in the good category. at the second meeting the percentage score was 88% in the very good

category. then at the third meeting the percentage score was 94% in the good category. The average percentage value from observations of learning implementation is 84% in the very good category.

Next, measurements were carried out to determine the quality of the VAK model learning results using the MathCityMap application. Table 4 presents the results of the due diligence calculation with the test criteria being $\boldsymbol{H_o}$ rejected if $\boldsymbol{Z_{count} \geq Z_{(0,5-\propto)}}$ where $\boldsymbol{Z_{(0,5-\propto)}}$ is obtained from the standard normal list with probabilities $\boldsymbol{(0,5-\propto)}$

$$\boldsymbol{Z = \frac{\frac{x}{n} - \pi_o}{\sqrt{\frac{\pi_o(1-\pi_o)}{n}}} = \frac{0,175}{0,087} = 2,01}$$

From the calculation results obtained $\boldsymbol{Z_{count} = 2,01}$. For α = 5%, is obtained $\boldsymbol{Z_{table} = Z_{(0,45)} = 1,64}$, $\boldsymbol{Z_{count} = 2,01 \geq 1,64}$, so $\boldsymbol{H_0}$ is rejected. So the percentage of students' mathematical literacy ability scores with VAK learning using the MathCityMap application that scored more than or equal to 70 is more than or equal to 75% based on OECD indicators.

Then a different test of students' mathematical literacy abilities was carried out with the testing criteria being $\boldsymbol{H_o}$ accepted if $\boldsymbol{t_{count} < t_{(1-\propto)}}$ where $\boldsymbol{t_{(1-\propto)}}$ obtained from the list t with $\boldsymbol{dk = n_1 + n_2 - 2}$ and significance level $\boldsymbol{\propto = 5\%}$. The calculation results of different literacy ability tests are presented in table 5.

$$\boldsymbol{t = \frac{15,44}{\sqrt{\frac{(25-1)80,15621 + (25-1)39,32544}{25+25-2}\left(\frac{1}{25}+\frac{1}{25}\right)}}}$$

From the calculation results obtained $\boldsymbol{t_{count}}$= 7,0631. For $\boldsymbol{\propto = 5\%}$ is obtained $\boldsymbol{t_{table} = t_{(0,45)} = 1,671}$, $\boldsymbol{t_{count}}$= 7,0631 > 1,671 so $\boldsymbol{H_o}$ is rejected. So the average mathematical literacy ability of students in VAK learning using the MathCityMap application is more than the average mathematical literacy ability of students in PBL learning.

Furthermore, in table 6 the test results for increasing mathematical literacy skills are presented using the testing criteria $\boldsymbol{H_0}$ accepted if $\boldsymbol{t_{count} < t_{(1-\propto)}}$, where $\boldsymbol{t_{(1-\propto)}}$ obtained from the distribution list t with $\boldsymbol{dk = n_1 + n_2 - 2}$ and opportunities $\boldsymbol{(1-\propto)}$.

Table 4. Due Diligence Calculation Results

π_0	x	n	$\frac{x}{n}$	$\frac{x}{n} - \pi_o$	$1 - \pi_o$	$\pi_o(1 - \pi_o)$	$\frac{\pi_o(1-\pi_o)}{n}$	$\sqrt{\frac{\pi_o(1-\pi_o)}{n}}$
0,745	23	25	0,92	0,175	0,255	0,189975	0,007599	0,087172243

Table 5. Results of Different Literacy Ability Tests

$\bar{x}_1$	$\bar{x}_2$	s_1	s_2	s_1^2	s_2^2	n_1	n_2	$\bar{x}_1 - \bar{x}_2$
85,08	69,64	8,953	6,271	80,15621	39,32544	25	25	15,44

Table 6. Test Results for Improving Mathematical Literacy Ability

$\bar{x}_1$	$\bar{x}_2$	s_1	s_2	s_1^2	s_2^2	n_1	n_2	$\bar{x}_1 - \bar{x}_2$
0,515081	0,31277	0,051117	0,00507	0,002613	0,000026	25	25	0,202311

$$t = \frac{0{,}202311}{\sqrt{\frac{(25-1)0{,}002613+(25-1)0{,}000026}{25+25-2}\left(\frac{1}{25}+\frac{1}{25}\right)}}$$

$$t = 19{,}2897$$

From the results of the calculations, the results are obtained t_{count}= 19,2897. For $\propto = 5\%$ is obtained $t_{table} = t_{(0,45)} =$ 1,67, t_{count}= 19,2897 > 1, 671 so H_o is rejected. So the average student's mathematical literacy ability in VAK learning using the MathCityMap application is more than the average gain score in PBL learning.

From the results of data analysis in research conducted by researchers regarding the quality of mathematical literacy in VAK model learning using mobile math trails at Junior High School 1 Trangkil, it is known that the percentage of students' mathematical literacy ability scores with VAK learning using the MathCityMap application scored more than or equal to 70 there is more than or equal to 75% based on OECD indicators. This can be seen from the calculation results obtained $Z_{count} = 2{,}01$. For α = 5%, is obtained $Z_{table} = Z_{(0,45)} = 1{,}64$, $Z_{count} = 2{,}01 \geq 1{,}64$, so H_0 is rejected. Then the average mathematical literacy ability of students in VAK learning using the MathCityMap application is more than the average gain score in PBL learning. It can be seen from the calculation results obtained t_{count}= 19,2897. For $\propto = 5\%$ is obtained $t_{table} = t_{(0,45)} = 1{,}67$, t_{count}= 19,2897 > 1, 671 So H_o is rejected.

Conclusion

Based on the results of this research, it can be concluded that learning with the VAK model using the MathCityMap application is proven to be able to improve students' mathematical literacy skills, compared to the PBL learning model. This can be seen from the increase in the average student score

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